



GoM Drilling, Completions and Interventions -

Deepwater Horizon MC252 Response

OFFSHORE Air Monitoring Plan for Source Control

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AMENDMENT RECORD

Amendment Date	Revision Number	Amender Initials	Amendment
05/07/2010	0		Approved - Issued for Use
5/12/2010	1		Approved – Issued for Use – Revised document to add language on drive-off levels for Benzene and added a section on respiratory protection.
5/18/2010	2		Approved – Issued for Use – Revised document to update title of incident from “MC252” to Deepwater Horizon Response. Clarified this document to pertain to Offshore Source Control area (removed language around “skimming operations”). Added language on respirator cartridge change-out schedule; added section on Vessel Cabin Air Quality Control which outlines the use of activated charcoal filters in HVAC intake units.
5/22/2010	3		Approved – Issued for Use – Revised document to clarify the recommended actions specified in Tables 4.1 Action Levels for Personal Exposure and 4.2. Action Levels for Safe Operations.
5/24/2010	4		Approved - Issued for Use - Revised document to update title of incident from Deepwater Horizon Response to Deepwater Horizon MC252 Response. Removed “skimming vessels” from Tier III designation to clarify and relate document to Offshore Source Control. Revised document to clarify the recommended actions specified in Tables 4.1 Action Levels for Personal Exposure (added full-faced respirators). Revised Section 4 Site Action Levels document to clarify sampling procedures and PPE use. Clarified respirator cartridge service life table (referenced relative humidity, temperature, cartridge brand and values in table footnote). Revised respirator use information (now included in Action Level table).

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1 Introduction

This plan is intended to minimize the risks to workers who are performing Source Control for the Deepwater Horizon incident. The origin of the oil released from the incident is located approximately 50 miles southeast of Venice, Louisiana and has the potential to impact the shore line, offshore assets, drilling rigs and other operations with oil.

This plan addresses air monitoring and sampling during the mitigation operations of the impacted areas. Thus, the purpose of this sampling includes the following:

- Monitor the air around the mitigation activities to protect potential downwind receptors.
- Monitor air in the vicinity of mitigation activities to protect workers.
- Monitor specific activities to support safe operations.

Air monitoring will continue until the mitigation process is complete. Air monitoring and sampling data will be summarized and reported to Unified Command through the Houston IMT Safety Officer.

An operational risk-based approach will be employed in the implementation of this plan and will involve a three-tiered system. These tiers are identified as follows:

- Tier I – High Priority - Vessels which are attached or essentially attached to the sea floor, e.g. drill ships.
- Tier II – Moderate Priority - ROV support vessels that can move off with short notice.
- Tier III – Reduced Priority - Supply Vessels and other vessels which can easily move in and out of the Source Control area.

2 Air Monitoring Instrumentation

Real-time air monitoring for VOCs will be performed during oil cleanup and source control activities. Air monitoring will be performed using photo-ionization detectors (PIDs) and the UltraRAE benzene monitor. The PIDs will be used to detect volatile components of the crude oil. The UltraRAE will be used for benzene specific analysis in the event that elevated VOCs are detected using a PID. The UltraRAE is equipped with a 9.8 eV lamp. Real-time monitoring will be conducted using the Rae Systems AreaRAE with photo ionization detectors (PID) which are equipped with 10.6 eV lamps. Additional electrochemical sensors on the AreaRAE measure the Lower Explosive Limit (LEL), Hydrogen Sulfide and Carbon Monoxide (CO).

The term “real-time” refers to direct reading instruments that allow nearly instantaneous determinations of a chemical concentration in air. Real-time measurements provide immediate information for worker and community exposure scenarios and, with the use of appropriate site safety measures, help prevent overexposures. Real-time measurements are not directly comparable to OSHA or ACGIH 8-hour TWA values or to community exposure standards or guidelines. Instantaneous real-time samples do not necessarily represent conditions experienced throughout the workday and can substantially underestimate or overestimate exposures potentially experienced by workers. Direct reading instruments perform sampling and

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analyses within the instrument and concentration readings can usually be obtained immediately. These instruments have fast response times and can follow rapid changes in concentration.

3 Site Monitoring Locations

Vessel operators will work with the Air Monitoring Technicians to select real-time monitoring locations in common work areas and inside crew quarters. Additional monitors may be placed near the edge of the vessel or in other areas of interest, such as moon pools, to gain early indications of rising LEL levels. Handheld monitors are also available to sample in real-time for LEL, VOCs, H₂S, and benzene. Manually logged real-time data for benzene will be collected and reported on approved field forms at prescribed intervals. This data will be shared with response stakeholders.

After initial characterization of the immediate work site has been completed, air monitoring will be continued at regular intervals in the vicinity of operations being conducted. The air monitoring results shall be sent to the Industrial Hygiene Unit Leader in Houston for review at intervals not to exceed 12 hours. At no time, though, shall air monitoring activities impede operations or endanger personnel.

The Air Monitoring Technician will determine location(s), time and duration of air monitoring. Where continuous monitoring instrumentation is not installed, the Air Monitoring Technician will default to monitoring every hour or as conditions change until personnel suspend operations or depart the work site. In addition to general area monitoring aboard vessels, a specific request has been made to conduct air monitoring by exhaust vents or ballast vents which discharge into the work area. If conditions change (such as the amount of oil in the work area, an increase in a reading of VOCs, or a shift in the winds towards the workers, for example), air monitoring should be done immediately following the change, and the need to monitor more frequently should be considered.

Spill recovery and source control site personnel and supervisors shall be updated regularly of the air monitoring results. At minimum, the Air Monitoring Technician shall update the OIM of levels over the preceding 12 hours once per shift.

4 Site Action Levels

Site action levels have been established for airborne hazards. Vessels should execute their own safety evacuation/emergency response plan when action levels are exceeded.

NOTE: For any action levels triggering the use of half-face respirators, non-vented goggles are recommended to reduce the potential for eye irritation. 3M 8577 P-95 masks are available for nuisance odors and can be used up to 100 ppm VOCs and 0.5 ppm benzene.

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4.1 Action Levels for Personal Exposure

Chemical	Action Level (all deck and living areas)	Monitoring Condition	Actions
VOC, ppm	50	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> At the OIM's or Captain's discretion, deploy standby vessels for dispersant or foam application (if approved) or utilize water cannons to break up sheen. Take additional benzene specific readings to determine benzene levels.
VOC, ppm	100	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> Increase airflow with portable industrial fans Don half-face, OV cartridge respirators to continue working in the area. Non-essential personnel should relocate to an area of lower concentration (i.e., move to different location on the vessel or move to the living quarters or galley) Re-orient vessel into wind At the OIM's or Captain's discretion, deploy standby vessels for dispersant or foam application (if approved) or utilize water cannons to break up sheen.
VOC, ppm	300	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> Don full-face, OV cartridge respirators to continue working in the area.
VOC, ppm	1000	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> Move vessel off location

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Benzene, ppm	0.5 (on deck or in living quarters)	At least 3 samples over 15 minutes	<ul style="list-style-type: none"> • Increase airflow with portable industrial fans • Don half-face, OV cartridge respirators to continue working in the area. • Non-essential personnel should relocate to an area of lower concentration (i.e., move to different location on the vessel or move to the living quarters or galley) • Re-orient vessel into wind • At the OIM's or Captain's discretion, deploy standby vessels for dispersant or foam application (if approved) or utilize water cannons to break up sheen.
Benzene, ppm	10 (on deck)	At least 3 samples over 15 minutes	<ul style="list-style-type: none"> • Personnel should relocate to an area of lower concentration. • Don full-face, OV cartridge respirators to continue working in the area. (Maximum concentration for this respirator is 50 ppm.)
Benzene, ppm	10 (living quarters)	Sustained for 15 minutes as confirmed by two instruments	<ul style="list-style-type: none"> • Move vessel off location.
Carbon monoxide, ppm	25	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> • Evacuate immediate work area to area of lower concentration
H ₂ S, ppm	5	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> • Evacuate immediate work area to area of lower concentration

Above the Action Level, a beeping alarm with a red flashing light will sound on the monitor where the result was detected. Once the action level has been consistently above the limit for 15 minutes, the Air Monitoring Technician will notify the crew to leave the immediate area to an area of lower concentration (i.e., move to different location on the vessel or move to the living quarters or galley). Additionally, the Air Monitoring Technician will immediately inform the OIM that a consistent reading has been confirmed and that the area of the vessel in which the monitor is located is considered a restricted area. The area will remain a restricted area until levels are consistently below the action limit. Air monitors indicate levels in the immediate environment surrounding the monitor.

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At a minimum, benzene readings are collected manually once every 12 hours or when VOC action levels of 50 ppm are exceeded. If a benzene result exceeds the action level, the Air Monitoring Technician will verify that the action level is sustained by collecting at least three samples over a 15 minute period. A new separator tube should be installed before conducting each verification test. If the greater than 10 ppm (on deck) action level is confirmed, the area will be considered a restricted area until levels are consistently below the action limit for 15 minutes. The Air Monitoring Technician will notify the crew to leave the immediate area to an area of lower concentration. If the levels of benzene to unprotected workers in the living quarters exceed 10 ppm sustained for 15 minutes as confirmed by two instruments, the vessel should drive off of the location and the living quarters should be ventilated with clean air. Additionally, the Air Monitoring Technician will immediately inform the OIM that a consistent reading above the action levels has been confirmed and that the area of the vessel in which the monitor is located is considered a restricted area.

When levels of VOC or benzene exceed action level, work may continue in the restricted area by wearing a respirator with organic vapor cartridges. Prior to allowing the use of respiratory protection, the vessel must put in place a respiratory protection program which includes training, medical certification, and fit-testing of personnel that are performing work in restricted areas (see Section 7 Respiratory Protection for more detail). If there is potential to come in contact with hydrocarbon contaminated material, additional personal protective equipment should be considered based on the task including nitrile or neoprene gloves, PVC boots, and slicker suits.

At the OIM's discretion, the vessel may implement other controls to reduce airborne hazards below action limits such as moving portable industrial fans to increase air flow, repositioning the vessel, notifying standby boats with water cannons to break up sheen in the immediate area or requesting application of dispersants or foams from standby boats, if approved. It is recommended that each vessel install activated charcoal filters on the ventilation system intakes to provide a clean air environment within the crew quarters.

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4.2 Action Levels for Safe Operations

Hazard	Action Level	Monitoring Condition	Actions
Flammable, %LEL	10%	Continuous levels confirmed by 2 or more monitors for 15 minutes	<ul style="list-style-type: none"> Notify the OIM that control measures are required. The OIM will evaluate and implement controls to reduce LEL levels below the 10% action level. (See more details in the paragraphs following this table.)
Flammable, %LEL	40%	Instantaneous reading confirmed by 2 or more monitors	<ul style="list-style-type: none"> Move off location.

Lower Explosive Limit (LEL) action levels are designed to create a safe operating environment. The 10% LEL action level is designed to indicate that action is needed to reduce airborne hazard levels. This level is confirmed by detection of 10% or more LEL consistently on 2 or more monitors for 15 minutes. At this level, the Air Monitoring Technician should notify the OIM that control measures are required. The OIM will evaluate and implement controls to reduce LEL levels below the 10% action limit such as moving or repositioning the vessel, notifying standby boats with water cannons to break up sheen in the immediate area or requesting application of dispersants from standby boats.

When the LEL level is between the 10% and 40% LEL action levels, Notify the OIM that control measures are required. The OIM will evaluate and implement controls to reduce LEL levels below the 10% action level.

The 40% LEL action level or exceedence of the benzene (>10 ppm in living quarters) action level indicates when immediate action for safe operation is required. This level is confirmed by detection of 40% or greater LEL instantaneously on 2 or more monitors at the same time, or by detection of >10 ppm benzene continuous in living quarters as confirmed by 2 or more monitors at the same time. At this level, the Air Monitoring Technician will immediately notify the OIM this level was confirmed. The OIM will suspend vessel operations and the vessel will drive-off location to the safe zone and await further instructions. A ship announcement will be made upon notification by the Air Monitoring Technician (or any crew member) to the OIM. The OIM will communicate moves through the appropriate SIMOPS Coordinator. Prior to re-entry, other support vessels will verify the LEL is below the action limit and communicate results to the affected vessel.

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Utilize other support vessels or small crew boats in the vicinity that are equipped with AIR MONITORING Techs and monitoring equipment to provide clearance monitoring. The clearance monitoring will provide information to the main vessel when it is safe for the vessel to re-enter the area.

5 Monitoring of Personnel

Organic Vapor Monitor (OVM) badges will be used to assess personnel exposures to benzene and other hydrocarbons. OVM badges are to be placed on personnel identified as having the highest potential for exposure. Air monitoring will be conducted on workers who spend the most time on the deck each day. A representative population to be sampled will be determined by the BP Industrial Hygienist (Source Control) or approved designate. OVM badges will be analyzed by Bureau Veritas, American Industrial Hygiene Association accredited laboratory, using an OSHA Method 7 for analysis. Results will be communicated to personnel and supervisors via the contact information provided to the Air Monitoring Technician.

6 Data Quality and Documentation Management

The following applies to data quality and documentation management:

- All analytical air sample results will be sent to the Industrial Hygiene Lead in the Houston Command Center.
- Bureau Veritas, an AIHA Accredited Laboratory, located in Novi, Michigan will be used to analyze the samples
- The data packets will be reviewed and the data will undergo a data validation process.
- All real-time instruments will be calibrated according to the manufacturer recommendations or shall be maintained and calibrated as necessary to ensure consistent reliable data production.
- Calibration will be documented by the Air Monitoring Technician daily and documented on the calibration log.
- Real-time readings will be documented by handwritten notes, handheld PDA, or by the use of data logging capabilities of the instrument, if available.
- Real-time data will be entered onsite and drafts made available upon request.
- The IH Unit Leader in Houston will provide data summaries to the Safety Officer.

7 Respiratory Protection

Personnel in the response action may be required to wear a respirator when conditions dictate their use as outlined in Table 4.1. All response organizations are following their appropriate respiratory protection programs in compliance with applicable governing regulatory bodies. These programs are inclusive of appropriate training, qualifications, as well as procedures for the safe use of respirators in conjunction with the Deepwater Horizon response.

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Specific potential respiratory hazards associated with this response are:

- Generic hydrocarbon vapors (VOCs);
- Benzene;
- Hydrogen Sulfide; and
- Carbon Monoxide.

Employees are being recommended to be fit tested quantitatively. However, response companies may fit test their employees qualitatively in conjunction with their company's operational safety requirements. BP will still recommend and will provide these companies' employees an opportunity to undergo a quantitative fit test. Fit testing and respirators will be provided and used as follows:

Fit Testing Procedures:

Offshore Fit Testing is being performed in order to provide additional mitigation and a measure of comfort and assurance. Below are the steps that outline the offshore fit testing.

- Operations will need to contact the Houston IMT – Health and Safety Unit to request fit testing. This office can be reached at XXXXX or XXXXX.
- Operations will need to provide a contact on the vessel to receive an instruction packet for the fit testing program.
- Health and Safety Unit will coordinate fit testing with the Qualified Technicians.
- Employees will have to complete the Medical Evaluation questionnaire (MEQ) for medical approval. The questionnaire will need to be faxed, scanned, or delivered as per the instruction packet.
- Once medically approved, individuals will be fit tested on the mask type and size they will be using. Additionally, individuals must receive Respirator Training prior to using the respirator. Individuals being fit tested must be clean shaven according to the packet guidelines.
- After fit testing, users will be given a respirator selection card, which shows the type and size of mask they were fitted on.

Onshore Fit Testing is also being performed to further expedite the fit testing process. Onshore fit testing should be utilized for fit test individuals who are rotating onto the vessels, as they show up at the Heliport. Below are the steps that outline the onshore fit testing program.

- Fit testing trailer will be set up at the Heliport South Parking lot, and is located in the "Core" trailers.
- Personnel designated by Vessel Operator/BP for fit testing complete a MEQ, the MEQ is then reviewed onsite by a Medical Professional for approval.
- If approved for fit testing, the individual will be fitted and tested on the type and size of mask the individual will be utilizing.
- Each crew member will need to complete respirator training prior to being allowed to wear the respirator.

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- Onshore fit testing has been set up to fit test individuals before or after crew change occurs.
 - After fit testing, users will be given a respirator selection card, which show the type and size of mask they were fitted on.

Respirator cartridges need to be changed-out/replaced on a daily schedule (i.e. should be replaced at the end of every work-shift and not to exceed 16-hours). Please see the specific respirator change-out details listed by manufacturer below.

Please contact BP Onshore Logistics at XXXXX to coordinate the orders, distribution, and delivery of the cartridges and/or masks.

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Respirator Cartridge Service Life Summary ¹			
Cartridge ²	Contaminant	Value ³ (ppm)	Change-Out
3M 8577 P-95 Mask	n/a	n/a	End of Shift ⁴
3M 6001 OV	Benzene	5.1 - 10.0	7 Hours
3M 6001 OV	Benzene	1.1 - 5.0	8 Hours
3M 6001 OV	Benzene	0 - 1.0	End of Shift ⁴
3M 6003 OV/AG	Benzene	5.1 - 10.0	6 Hours
3M 6003 OV/AG	Benzene	1.1 - 5.0	7 Hours
3M 6003 OV/AG	Benzene	0 - 1.0	End of Shift ⁴
3M 60923 OV/AG/P100	Benzene	5.1 - 10.0	6 Hours
3M 60923 OV/AG/P100	Benzene	1.1 - 5.0	7 Hours
3M 60923 OV/AG/P100	Benzene	0 - 1.0	End of Shift ⁴
3M 6001 OV	VOCs ⁵	301 - 1000	2 hours
3M 6001 OV	VOCs ⁵	151 - 300	4 hours
3M 6001 OV	VOCs ⁵	11 - 150	8 hours
3M 6001 OV	VOCs ⁵	0 - 10	End of shift ⁴

- 1 - This information was obtained from the 3M Respirator Cartridge Service Life Indicator Software assuming medium work rates, relative humidity of 90% and temperature of 86 degrees Fahrenheit.
- 2 - Service life summary is based on 3M cartridges and should not be used with other cartridge manufacturers.
- 3 - Values are based on average readings over a work shift.
- 4 - "End of Shift" refers to the work day at less than 16 hours.
- 5 - Total VOC values are based on Xylene as the cartridge contaminant..

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8 Vessel Cabin Air Quality Control

Activated charcoal Heating Ventilating and Air Conditioning (HVAC) filters are recommended to reduce odor infiltration into living quarters. This recommendation applies to all Tier I and Tier II Vessels as outlined in Section 1 of this plan. Below is contact information on the filters that have been installed on vessels and shown success. Please contact BP Onshore Logistics at XXXXX to coordinate the ordering, distribution, and delivery to the vessel.

MWV Specialty Chemicals
HM Filter -MeadWestvaco Activated Carbon Filtration
1-800-348-7196
www.mwvspecialtychemicals.com

Air Filters, Inc
Honeycomb Carbon Air Filters
1-800-667-8563
www.airfilterusa.com

Air Flow Technology
Carbon impregnated pleated filters
1-800-537-5454
www.airflowtechnology.com

Aeron
GC Activated Carbon Filter
Phone: +47 38 32 78 00
www.aeron.no

Flanders Filters, Inc.
531 Flanders Filter Road
Washington, NC 27889
Phone: (252) 946-8081
Toll Free: (800) 637-2803
Fax: (252) 946-3425
[Website: www.flanderscorp.com](http://www.flanderscorp.com)

- **Filter Change-out Frequency:** To best determine a change-out frequency of filters for each vessel it is recommended to use VOC monitors to measure levels (on indoor-side of HVAC) twice daily. (i.e. once in the morning and again in the afternoon). If levels inside cabin exceed 50 ppm VOC action limit, change filter.

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9 Qualified Personnel

Personnel who serve as Air Monitoring Technicians or Industrial Hygienists for this response shall be qualified in accordance with their respective organizations' policies to perform initial site surveys and site monitoring using appropriate atmospheric equipment for oil spill response, recovery and remediation activities.

10 Roles & Responsibilities of Air Monitoring Technicians

The Air Monitoring Technician's role is to ensure that personnel performing spill clean-up operations or working on the deck of response vessels are not being overexposed to benzene and other hydrocarbons.

The Air Monitoring Technician's responsibilities include:

- Calibrating air monitoring instruments daily.
- Conducting air monitoring according to the plan and keeping written documentation of results.
- Conducting follow-up air monitoring within 15 minutes to confirm readings when results exceed the action limit.
- Informing the OIM / lead supervisor / captain on the vessel immediately when results exceed action limits, so that the supervisor / captain can implement controls to protect personnel.
- Provide periodic updates of air monitoring results to the lead supervisor / captain on the work site / vessel
- Provide copies of the air monitoring results to the Houston Industrial Hygiene Unit Leader and to the Houston IMT Safety Officer every 12 hours.

11 Equipment Decontamination

No field instruments/equipment decontamination is required under foreseeable conditions. Respirator masks should be cleaned and maintained with the appropriate cleansing/disinfecting wipes provided and in accordance with respirator manufacturer's care and maintenance instructions.

12 Calibration and Maintenance of Field Instruments

The calibration, usage, and maintenance of field equipment and instrumentation will be in accordance with each manufacturer's specifications or applicable test/method specifications. At least 2 back up AreaRae instruments, 1 UltraRae instrument and replacement supplies will be maintained aboard the vessel.

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13 Questions or Concerns:

Personnel have been instructed to contact their Supervisor if they have concerns about their health due to changing workplace conditions.

These Questions or concerns shall be directed to the Safety and Health Unit so they can be assessed:

Houston Source Control:

Safety Officer:

Safety & Health Unit Leader:

IH Unit Leader:

Title of Document:	OFFSHORE Air Monitoring Plan for Source Control	Document Number:	2200-T2-DO-PN-4002
Authority:	Safety Officer/Sr. Industrial Hygienist	Revision	4
Custodian/Owner:		Issue Date:	5/7/2010
Retention Code:	ADM3000	Next Review Date (if applicable):	5/3/2011
Security Classification:	Project Confidential	Page:	Page 16 of 17
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Special Instructions	Deepwater Horizon Incident
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Document Details

Document Number	2200-T2-DO-PN-4002	Revision	4
Document Title	Deepwater Horizon Response Offshore Air Monitoring Plan for Source Control		
Next Review Date			
Reason for Issue (check as applicable)	New Document	Revised Document	Obsolete Document
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2020-T2-DM-FM-000002	4	Document Authorization Form
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